

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

ECE2056 – DATA COMMUNICATIONS AND NETWORKING

(All sections)

2 JUNE 2017
3.00 P.M. - 5:00 P.M.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This examination paper consists of 6 pages with 4 questions only.
2. Answer **ALL** the 4 questions. The distribution of marks for each question is given.
3. Please print all your answers in the Answer Booklet provided.

Question 1 (33 marks)

- (a) Describe the functions of the main layers in the Transmission Control Protocol/Internet Protocol (TCP/IP) model.
[5 marks]
- (b) State the type of addressing used in the data link layer and transport layer of the TCP/IP model. Discuss **TWO** main differences between the two types addressing.
[6 marks]
- (c) Discuss the difference in delays between a datagram network and virtual-circuit network.
[4 marks]
- (d) With the aid of a diagram, describe the Address Resolution Protocol (ARP) operation and its importance in link-layer addressing.
[6 marks]
- (e) Describe briefly the following about the Point to Point Protocol (PPP) protocol:
- (i) Transition phases to establish a PPP connection.
[6 marks]
 - (ii) **THREE** categories of protocols and their respective functions within the PPP protocol.
[6 marks]

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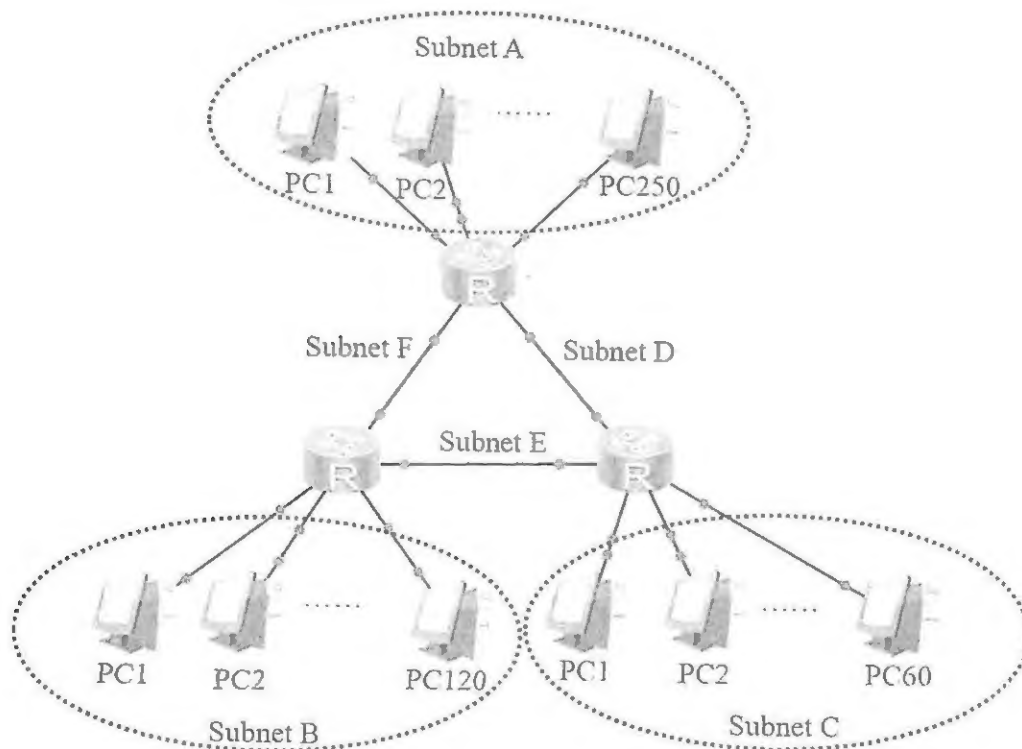
Question 2 (22 marks)

- (a) The distance between station A and station B in a **100 Mbps** network is **1.5 km**. The signal propagation speed is 2×10^8 m/s. The network implements **CSMA/CD** random access protocol. Station A starts sending a frame at time $t = 0$, while station B starts sending at $t = 5 \mu\text{s}$.
- (i) Find the minimum frame size. [3 marks]
 - (ii) How many bits has station B sent before detecting the collision? [3 marks]
 - (iii) At what time does station A detect the collision? [2 marks]
- (b) Channelization is a multiple access method in which available bandwidth of a link is shared among stations. Briefly describe **THREE** channelization methods. [6 marks]
- (c) Will a receiver discard an Ethernet frame if the following addresses appear as the source address? Why?
- (i) 2B:3F:44:4A:21:91 [2 marks]
 - (ii) 42:6C:3B:77:32:8E [2 marks]
 - (iii) FF:FF:FF:FF:FF:FF [2 marks]
- (d) State **TWO** reasons the CSMA/CD does not work in wireless LAN. [2 marks]

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Question 3 (22 marks)

- (a) The datagrams that travel between source Host A and destination Host B are limited to 1500 bytes. Fragmentation is not required because the size of these datagrams is smaller than the Maximum Transfer Unit (MTU) of the link. If each datagram consists of a 20-byte Internet Protocol (IP) header, how many datagrams would be required to send a video file consisting of 4 Mbytes? Specify the size of the last datagram.
- [4 marks]
- (b) Sending a 4000-byte datagram with a 20-byte IP header into a link with an MTU of 500 bytes requires fragmentation. How many fragments are generated? What is the size of each fragment? Specify the fragmentation offset and flag for each fragment.
- [6 marks]
- (c) Consider the topology shown in **Figure Q3(c)**. All addresses must be allocated from 217.98.254.0/23 (in binary format as 11011001.01100010.11111110.00000000).

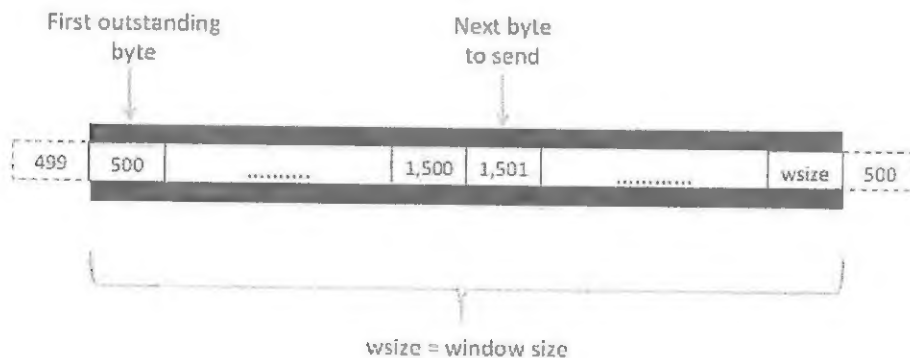
**Figure Q3(c)****Continued ...**

- (i) Identify the maximum number of addresses that can be supported in this network. State the first address and the last address. [3 marks]
 - (ii) Assign IP addresses to Subnet A, supporting 250 interfaces. [1 mark]
 - (iii) Assign IP addresses to Subnet B, supporting 120 interfaces. [1 mark]
 - (iv) Assign IP addresses to Subnet C, supporting 60 interfaces. [1 mark]
 - (v) Assign IP addresses to Subnets D, E, F, each supporting 2 interfaces. [2 marks]
- (d) (i) IPv4 has some deficiencies that make it unsuitable for the fast-growing internet. Hence, IPv6 is proposed to replace IPv4. State **TWO** advantages of IPv6 over IPv4. [2 marks]
- (ii) Specify IPv6 address 2001:1265:0000:0000:0AE4:0000:005B:06B0 with Both Zero and Leading Zero compression. [2 marks]

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Question 4 (23 marks)

- (a) Simple Mail Transfer Protocol (SMTP) is used in sending electronic mail. Explain in detail why SMTP uses Transmission Control Protocol (TCP) for its transport protocol rather than use User Datagram Protocol (UDP). [5 marks]
- (b) In a Go-Back-N with sliding window protocol, given that sliding windows size is 8. Draw the timing diagram between sender and receiver in a single diagram for the following:
- The first 2 packets had been sent and acknowledged. [3 marks]
 - The 3rd and 4th packets received by the receiver and the acknowledgment packets were sent. However, the 3rd acknowledgment packet is lost during transmission. Show and explain what happened to both received packets. [3 marks]
 - The 5th to 7th packets are sent. But, the 5th packet is lost during transmission. Show and explain what happened to all these packets. [4 marks]
- (c) Given that in a TCP Window, the receive window (rwnd) size is 5,000 bytes and the congestion window (cwnd) size is 2,500 bytes. **Figure Q4(c)** shows the TCP window. Answer the following questions:

**Figure Q4(c)**

- What is the maximum send window size? [2 marks]
- If 1,000 bytes have been sent but did not receive acknowledgement, how many bytes can the system send? [3 marks]
- If the last sender byte is byte number 3,000. Then, 1,500 bytes have been sent but did not receive acknowledgement, what would the current window range be? [3 marks]

End of paper